

## Claims

1. A flow control valve, comprising:
  - a flexible ring-shaped structure defining a central opening surrounded by non non-wetted surface thereof;
  - said ring-shaped structure having a wetted surface therewithin in fluid communication with multiple flow ports;
  - an actuator having a pivoting element with two ends, that fits within said ring-shaped structure;
  - said actuator having fixed elements that with edges that oppose said two ends on respective sides such that when said pivoting element is pivoted in a first direction, it pinches a first two portions of said ring-shaped structure against a first two of said edges, said first two portions corresponding to a first two flow passages of said ring-shaped structure and such that when said pivoting element is pivoted a second direction, it pinches a second two portions of said ring-shaped structure against a second two of said edges, said second two portions corresponding to a second two flow passages of said ring-shaped structure, a configuration of said ports being such that communication between a first two of said flow ports is blocked while fluid communication between a second two

of said flow ports is permitted when said pivoting element is pivoted in said first direction while communication between a second two of said flow ports is blocked while fluid communication between a first two of said flow ports is permitted when said pivoting element is pivoted in said second direction.

2. A valve as in claim 1, wherein said fixed and pivoting elements are arranged to define a ring-shaped recess into which said ring-shaped structure fits.

3. A flow control valve, comprising:

a flexible valve body linking together, for fluid communication, fluid ports fluidly connected by said valve body;

said valve body forming a structure that surrounds a first portion of an actuator with at least one first pinching element;

a second portion of said actuator that slides relative to said first portion;

said valve body being at least partly confined within;

second portion having at least one second pinching element opposing said at least one first pinching element;

in a first configuration, said actuator pinching said valve body such that a first pair of said fluid ports are linked for fluid communication while a second pair is blocked;

in a second configuration, said actuator pinching said valve body such that a second pair of said fluid ports are linked for fluid communication while said first pair is blocked.

4. A valve as in claim 3, wherein a planar projection of said valve body is ring-shaped.

5. A blood flow reversing device for blood processing, comprising:

a pair of patient-side ports for connection to a patient access;

a pair of treatment-side ports for connection a blood processing machine;

a reversing valve configured to allow blood to flow between said patient-side and said treatment-side ports in two selected directions of flow in said patient-side ports, such that blood flow from said patient-side ports and said patient access is selectively reversible;

a controller configured to control said reversing valve and to reverse said blood flow for a first interval at a first frequency and for second

interval on at a second frequency, said first frequency being greater than said second frequency.

6. A device as in claim 5, wherein said second interval is longer than said first interval.

7. A device as in claim 5, further comprising a housing having said patient side ports on a first end and said treatment-side ports on a second end, whereby said flow reversing device may be located close to said patient access and remote from a blood treatment machine.

8. A device as in claim 7, further comprising an air detector.

9. A device as in claim 7, further comprising an air detector, said reversing valve being configured to block blood flow through said treatment-side ports and said controller being configured to control said reversing valve to block said blood flow in response to a detection of air in blood by said air detector.

10. A blood flow reversing device for blood processing, comprising:

a reversing valve configured to reverse blood flow between a treatment apparatus and a patient access;

a controller configured to control said reversing valve and to reverse said blood flow for a

first interval at a first frequency and for second interval on at a second frequency, said first frequency being greater than said second frequency.

11. A device as in claim 10, wherein said second interval is longer than said first interval.

12. A flow control valve, comprising:  
a flexible valve body linking together, for fluid communication, fluid ports fluidly connected by said valve body;

an actuator having first and second clamp elements that are mutually selectively movable in first and second directions;

said actuator pinching said valve body such that a first pair of said fluid ports are linked for fluid communication while a second pair is blocked when said first and second clamp element are mutually moved in said first direction;

said actuator pinching said valve body such that a second pair of said fluid ports are linked for fluid communication while said first pair is blocked when said first and second clamp element are mutually moved in said second direction.

13. A device as in claim 12, further comprising a housing having patient side ones of said fluid ports on a first end and treatment-side ones of

said fluid ports on a second end, whereby said device may be located close to a patient access and remote from a blood treatment machine.

14. A device as in claim 12, further comprising an air detector.

15. A device as in claim 12, further comprising an air detector, said actuator being configured to block blood flow through said at least one of said fluid ports and said controller being configured to control said reversing valve to block said blood flow in response to a detection of air in blood by said air detector.